

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, DC 20554

In the Matter of )  
 )  
International Bureau Seeks Comment ) IB Docket No. 16-185  
On Recommendations Approved By )  
World Radiocommunication Conference )  
Advisory Committee )

To: The International Bureau

**COMMENTS OF  
THE BOEING COMPANY**

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## **SUMMARY**

The United States delegation to the 2019 World Radiocommunication Conference (“WRC-19”) must recognize that U.S. industry is in a race with other countries for leadership in a variety of critical fields, including autonomous vehicles and aircraft, commercial use of space, artificial intelligence and nanotechnology. Research, production, and growth in many of these fields depends on reliable access to spectrum resources for communications and operational control, including access to millimeter wave frequencies in increasingly higher spectrum bands. Therefore, the efforts of the United States on behalf of proponents of 5G communications to attain US leadership in 5G should not be the only goal of the Commission and the United States. The Commission and the Administration must balance this goal with the critical needs of other U.S. industries, particularly those such as aviation and aerospace, which employ highly skilled workers primarily in the United States, rather than in foreign countries.

With this background, Boeing provides the following comments on the recommendations of the WRC-19 Advisory Committee (“WAC”) with respect to the appropriate proposals to ultimately be advanced by the United States Delegation to WRC-19:

### **Aerospace and Satellites**

- The Commission should support the recommendation for a draft U.S. proposal to WRC-19 for a primary allocation for the geostationary (“GSO”) fixed-satellite service (“FSS”) in the 51.4-52.4 GHz band in order to make additional frequencies available for gateway earth stations operating with V-band satellite networks. (WAC/088)
  - As Boeing and others demonstrated in the context of the Spectrum Frontiers proceeding, gateway earth stations (including those operating with either GSO or non-geostationary satellite orbit (“NGSO”) systems) can share portions of the V-band with terrestrial mobile services using relatively small exclusion zones in rural and remote areas away from the population centers where terrestrial mobile services are expected to operate.

- The Commission should support the recommendation for a draft U.S. proposal for a WRC-23 Agenda Item addressing satellite-to-satellite links between NGSO and GSO satellite networks in portions of the Ka-band and V-band. (WAC/089)
  - Permitting the use of satellite-to-satellite links in FSS spectrum can greatly increase the efficiency of satellites in low Earth orbit (“LEO”) by giving them an always-available link to the ground even when they are beyond the line of sight of gateway earth stations located on major landmasses. Transmissions between NGSO and GSO satellites can be managed so that they produce no more interference to other satellite systems than existing transmissions between GSO networks and the ground.
- The Commission should support the recommendation for a draft U.S. proposal for a WRC-23 Agenda Item on permitting aeronautical and maritime communications using earth stations in motion (“ESIMs”) with GSO networks in portions of the Ku-band. (WAC/091)
  - Decades of operational experience have demonstrated that ESIMs can operate with FSS satellites without resulting in any additional interference into co-frequency spectrum users as compared to FSS earth stations operating at fixed locations. In addition, ESIMs provide important public interest benefits, enabling the provision of high data rate broadband services to consumers in mobile locations that were previously unserved or severely underserved.
- The Commission should support the recommendation for a draft U.S. proposal for a WRC-23 Agenda Item on the identification and adoption of regulatory measures that can facilitate the use of ESIMs with NGSO FSS systems in portions of the Ka-band and V-band. (WAC/093)
  - The growing use of ESIMs with FSS networks is already providing important public interest benefits by giving consumers access to high data rate broadband communications on mobile platforms. Further, ESIMs can operate safely and efficiently with NGSO FSS networks using the same mechanical and electronic tracking technologies that permit earth stations at fixed locations to operate with rapidly moving satellites in NGSO constellations.
- The Commission should support the recommendation for a draft U.S. proposal for a WRC-23 Agenda Item on the identification and adoption of regulatory measures to enable spectrum sharing between NGSO and GSO satellites in the 71-76 GHz and 81-86 GHz bands. (WAC/094)
  - The 71-76 GHz and 81-86 GHz bands could be used in the foreseeable future to support gateway earth stations operating with both NGSO and GSO satellite systems, in each case fully coordinated with the fixed service and other terrestrial services that may use this spectrum.

## **Aeronautical and Suborbital Issues**

- The Commission should support the recommendation for a draft U.S. proposal for a WRC-23 Agenda Item addressing the treatment of suborbital vehicles in the ITU Radio Regulations (WAC/080)
  - Although it is important to consider potential changes to the Radio Regulations to better incorporate suborbital vehicles, most of the considerations that should be addressed in this process will be technical in nature (including possibly the underlying definition of “suborbital vehicle”) and may not be addressed in Article 5 of the Radio Regulations.
- The Commission should support the recommendation for a draft U.S. proposal for a WRC-23 Agenda Item on the identification and implementation of updates to the ITU Radio Regulations to reflect the development of digital technologies in aeronautical high frequency (“HF”) communications. (WAC/081)
  - The transition from analog to digital HF radio communications in aviation will provide important benefits to aircraft transiting oceanic and polar regions where HF radio remains the primary communications link. Although the process of updating the ITU Radio Regulations to reflect these changes may require significant deliberation, the adoption of a WRC-23 Agenda Item would provide a suitable vehicle to form a basis for these discussions.
- The Commission should decline to support the recommendation for a draft U.S. proposal for a future agenda item on identifying spectrum for Electronic News Gathering unless the resolution addressing the agenda item expressly refrains from considering any use of frequency bands that are identified for aviation and navigation. (WAC/085)
  - The draft resolution under consideration before the WAC is overly broad (identifying the entire frequency range of 150-2000 MHz for consideration) without clearly excepting those portions of this frequency range that are used for critically important global positioning, air traffic management and communications functions that are often directly related to safety-of-life and efficient use of airspace.

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**COMMENTS OF  
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The Boeing Company (“Boeing”) provides these comments on the 2019 World Radiocommunication Conference (“WRC-19”) Advisory Committee (“WAC”) draft recommendations on issues to be considered by WRC-19.<sup>1</sup>

As the Commission is aware, Boeing is the leading U.S. exporter of aerospace products and services, contributing significantly to the U.S. economy and its balance of trade with foreign countries. Boeing employs more than 140 thousand people, the vast majority of which are in highly skilled positions in U.S.-based facilities located in 49 states. In 2018, Boeing generated more than \$100 billion in revenue.

Boeing’s substantial contributions to the U.S. economy depend on reliable and growing access to spectrum resources to support numerous critical functions, including autonomous operations and manufacturing; experimental research and flight testing; satellite and aerospace communications systems; aircraft navigation, control and monitoring systems; asset tracking and control; and countless other functions. To further these efforts, Boeing consistently holds far

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<sup>1</sup> See Public Notice, *International Bureau Seeks Comment on Recommendations Approved by World Radiocommunication Conference Advisory Committee*, DA 19-172 (March 11, 2019).

more FCC experimental licenses each year than any other entity, along with approximately 650 wireless licenses involving various radio services.

Boeing recognizes that spectrum is a very scarce public resource. Boeing therefore approaches radio spectrum matters as a highly responsible corporate citizen, participating actively in international and domestic spectrum policy development, both before the Commission and in the International Telecommunication Union Radiocommunication Sector (“ITU-R”) study process.

Boeing believes that continued U.S. leadership in technological growth and innovation requires a multifaceted approach to spectrum policy that recognizes the numerous dependencies that exist within industry, technology, and commerce on reliable access to spectrum for communications, control and testing. Just as the U.S. is in a race with other countries on global leadership in 5G communications, this same race exists with equal urgency in many other important fields that often necessitate the use of spectrum resources, such as autonomous vehicles and aircraft, commercial use of space, artificial intelligence, nanotechnology, and the production of renewable energy, just to name a few.

It is with this background that Boeing provides the following comments on the WAC draft recommendations for U.S. positions on issues to be considered by WRC-19. These comments are divided into two sections, the first addressing issues involving satellite communications and the second involving aircraft and suborbital systems. In both cases, many of the proposals discussed below involve the adoption of future WRC agenda items, ensuring that any future action on these issues will first be subject to multiple years of study in the ITU-R process and an opportunity for the Commission to consider the results of those studies in deciding whether to support the creation of new frequency allocations and regulations at future conferences.

## **I. THE UNITED STATES MUST CONTINUE TO SUPPORT THE GROWTH AND LONG TERM DEVELOPMENT OF SATELLITE COMMUNICATIONS TO ENSURE ITS GLOBAL LEADERSHIP IN AEROSPACE**

As U.S. Commerce Secretary, Wilbur Ross recently explained, “[t]he United States is experiencing a significant revival of its space industry.”<sup>2</sup> As a result, the global space economy now totals almost \$400 billion and is set to grow rapidly to \$1 trillion a year in annual revenue.<sup>3</sup> The U.S., however, is not alone in this resurgence. As Secretary Ross cautioned “more than 70 countries are now engaged in the global space industry, with more entering the market every year.”<sup>4</sup>

To maintain U.S. leadership in the commercial space industry, the United States needs to promote spectrum management policies that facilitate U.S.-based space ventures and technologies. President Trump previously recognized the importance of this policy mandate, directing his National Space Council, in cooperation with other federal agencies, including the Commission, to prepare a report on “improving the global competitiveness of the United States space sector through radio frequency spectrum policies, regulation, and United States activities at the International Telecommunication Union and other multilateral forums.”<sup>5</sup>

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<sup>2</sup> Remarks by Commerce Secretary Wilbur L. Ross at the Department of Commerce Space Investment Summit (Dec. 12, 2018) *available at* <https://www.commerce.gov/news/speeches/2018/12/remarks-commerce-secretary-wilbur-l-ross-department-commerce-space-investment> (*last visited* March 14, 2019).

<sup>3</sup> *See id.*

<sup>4</sup> *Id.*

<sup>5</sup> Presidential Memoranda, *Space Policy Directive-2, Streamlining Regulations on Commercial Use of Space*, at Sec. 5b (May 24, 2018) *available at* <https://www.whitehouse.gov/presidential-actions/space-policy-directive-2-streamlining-regulations-commercial-use-space/>.



Each of the following WAC recommendations addresses an important element of growth in satellite and space communications and operations. Boeing urges the Commission to advance these recommendations within the U.S. Government's deliberations on the formal positions and proposals of the United States to WRC-19.

**A. The Commission Should Support the Recommendation for a Draft U.S. Proposal to Adopt a Primary Allocation for the Geostationary Fixed-Satellite Service in the 51.4-52.4 GHz Band (WAC/088)**

As Boeing stressed in the context of the Commission's Spectrum Frontiers proceeding<sup>6</sup> and in support of a Petition for Rulemaking that Boeing filed with the Commission on this issue,<sup>7</sup> the V-band is the sole remaining greenfield spectrum that is suitable for broadband satellite systems using currently feasible technology. Given the critical importance of the V-band to the future of broadband satellite services, it is necessary for the United States to support the identification of spectrum sharing opportunities between satellite and terrestrial services in those portions of the V-band where sharing is achievable. The 51.4-52.4 GHz band clearly provides such an opportunity.

Spectrum sharing studies conducted by Boeing in the Spectrum Frontiers proceeding and the ITU-R study cycle clearly show that gateway earth stations operating in the fixed-satellite service ("FSS") can share with terrestrial services using modest separation distances and exclusion zones.<sup>8</sup> FSS gateways can be located outside of major population centers and transportation

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<sup>6</sup> See, e.g., Comments of The Boeing Company, GN Docket No. 14-177 *et al.* at 4-6 (Sept. 30, 2016).

<sup>7</sup> See e.g., Comments of The Boeing Company, RM-11773 at 5 (Oct. 17, 2016).

<sup>8</sup> In contrast, ubiquitously deployed end user terminals operating with GSO or NGSO FSS networks, such as in the 40.0-42.0 GHz and 48.2-50.2 GHz bands, cannot share spectrum with terrestrial services.

routes, thus ensuring that they will not inhibit the use of millimeter wave (“mmW”) spectrum for high density terrestrial wireless networks or fixed services. The locations and operations of FSS gateways can also be coordinated to avoid harmful interference to other space services, such as the earth exploration-satellite service and the radio astronomy service.

In urging support for the adoption of an FSS allocation in the 51.4-52.4 GHz band, Boeing recognizes that the allocation under consideration by WRC-19 would be limited to gateway earth stations serving FSS satellites in geostationary satellite orbit (“GSO”). Boeing believes this limitation is unnecessary given the documented ability of gateway earth stations operating with non-geostationary satellite orbit (“NGSO”) systems to share V-band spectrum with terrestrial and other space services. Nevertheless, the proposed allocation for GSO FSS gateways is a valuable first step in the overall process of implementing spectrum sharing in those portions of the V-band that are not used for satellite end user terminals. Further, the use of the 51.4-52.4 GHz band for feeder links serving GSO FSS networks may relieve some of the coordination burdens between GSO and NGSO satellite systems operating in other portions of the V-band.

**B. The Commission Should Support the Recommendation for a Draft U.S. Proposal for a WRC-23 Agenda Item on Satellite-to-Satellite Links from NGSO to GSO Satellites in Portions of the Ka-Band and V-Band (WAC/089)**

The Commission should support clarifications in the ITU Radio Regulations acknowledging the permissibility of communications between NGSO and GSO satellites in FSS spectrum allocations. The use of satellite-to-satellite links between NGSO and GSO satellites can provide substantial public interest benefits. For example, such links can facilitate spectrum sharing between NGSO FSS systems and terrestrial communications services by permitting NGSO FSS system operators to segregate the geographic locations of gateway earth stations into rural and remote areas, while avoiding the deployment of gateways in more populated areas.

The use of satellite-to-satellite links between NGSO and GSO satellite can also greatly increase the throughput and efficiency of satellites in low Earth orbit (“LEO”) by providing an always-available communications link to Earth via a higher orbit satellite. Absent this communications path, LEO satellites may be unusable for lengthy periods as they transit over oceans, ice caps and other areas beyond the sight of gateway earth stations. Although LEO satellites can sometimes employ satellite-to-satellite links between LEO satellites to reach an earth station, such measures are technically complex and rapidly consume the throughput capacity of multiple LEO satellites in carrying a single transmission to and from an earth station. In contrast, the use of a GSO satellite as a transmission path efficiently utilizes existing GSO system capacity and transponders (which are already pointed towards LEOs near Earth) and enables LEO-to-ground communications in a single hop.

Adequate rules already exist within the ITU Radio Regulations to protect adjacent GSO networks from transmissions from NGSO systems to GSO satellites. In the Ka-band, for example, the existing EPFDup limits for FSS Earth-to-space transmissions can be used to restrict the comparable communications from NGSO satellites to GSO networks. Boeing provided a technical analysis of this spectrum sharing scenario to the International Bureau in the context of Boeing’s NGSO FSS application.<sup>9</sup> To facilitate such spectrum sharing, the upward transmissions from LEO satellites to GSO networks will need to operate at much lower power levels than earth stations on the ground to address the absence of atmospheric attenuation between LEOs and the GSO arc. Given the significant variability of atmospheric attenuation, however, the appropriate

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<sup>9</sup> See Letter from Bruce A. Olcott, Counsel to The Boeing Company, to Jose P. Albuquerque, Chief, Satellite Division, FCC International Bureau, IBFS File No. SAT-LOA-20170301-00028, at 8-10 (July 24, 2017).

parameters for NGSO to GSO links should be far more predictable and reliable than the comparable communications links to GSO satellites from earth stations on the ground.

As the Commission has recognized, “the definition of FSS states that in some cases FSS may include satellite-to-satellite links, which may also be operated in the inter-satellite service.”<sup>10</sup> Given this foundation, Boeing supports future action by WRC-23 to affirm that NGSO satellites can permissibly communicate with GSO networks in portions of the FSS allocations in the Ka-band and the V-band in a manner that is consistent with the ITU Radio Regulations.

**C. The Commission Should Support the Recommendation for a Draft U.S. Proposal for a WRC-23 Agenda Item on Permitting Aeronautical and Maritime ESIM Communications With GSO Satellites in Portions of the Ku-Band (WAC/091)**

As decades of operational experience have demonstrated, earth stations in motion (“ESIMs”) can operate with FSS satellites without resulting in any additional interference into co-frequency spectrum users as compared to FSS earth stations operating at fixed locations. ESIMs also provide important public interest benefits, enabling the provision of high data rate broadband services to consumers in mobile locations, such as on aircraft and ships at sea. ESIMs also enable the remote operation of unmanned drones. Prior to the development of ESIMs, consumers in transit were required to rely solely on very low data rate communications services, if wireless connectivity was available at all. The introduction of broadband services provided by ESIMs, however, has greatly increased the efficiency and comfort of the travelling public, allowing them to work or be entertained during long hours in transit. ESIMs are also used to help manage the

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<sup>10</sup> See Streamlining Licensing Procedures for Small Satellites, IB Docket No. 18-86, *Notice of Proposed Rulemaking*, FCC 18-44, ¶ 70 (Apr. 17, 2018) (*citing* 47 CFR § 25.103).

operation of mobile platforms, providing real time diagnostics and other critical services for vehicle operators and their crew.

Given the significant public interest benefits and the advanced spectrum sharing capabilities of ESIMs, the United States should advocate in favor of permitting ESIMs to operate in all frequency bands that have been authorized for use by FSS satellite networks using the same protection requirements that exist for earth stations at fixed locations. As a component of this advocacy, Boeing supports a U.S. position that facilitates the adoption of a WRC-23 agenda item on permitting GSO FSS networks to communicate with ESIMs in portions of the Ku-band. Such a U.S. position would be consistent with rulemaking initiatives previously adopted by the Commission.

As a technical matter, the operation of ESIMs in the downlink bands of 10.7-10.95 GHz and 11.2-11.45 GHz should be a simple matter given the fact that ESIMs would simply be receiving the signals that are already transmitted toward the ground from GSO satellites. Therefore, the operation of ESIMs in this spectrum cannot result in harmful interference to other satellite or terrestrial services operating in these frequencies. As for the operation of ESIMs in the 12.75-13.25 GHz uplink band, technical studies conducted within the ITU-R study process can demonstrate the feasibility of ESIMs operating in this spectrum pursuant to the same restrictions that exist for FSS earth stations operating at fixed locations.

**D. The Commission Should Support the Recommendation for a Draft U.S. Proposal for a WRC-23 Agenda Item on the Regulatory Measures Necessary to Permit NGSO FSS Systems to Operate with ESIMs in Portions of the Ka-Band and V-Band (WAC/093)**

As discussed in the previous section of these comments, the use of ESIMs with FSS networks provides important public interest benefits by giving consumers access to high data rate broadband communications on mobile platforms that were previously unserved or severely

underserved prior to the development of this technology. No legitimate question exists about the ability of ESIMs to operate safely and efficiently with NGSO FSS networks. Unlike GSO satellites, which appear fixed in space, NGSO satellites pass quickly across the sky, requiring the use of earth stations that can track NGSO FSS satellites using mechanical or electronic technologies. These same tracking capabilities obviate the need for earth stations operating with NGSO FSS networks to remain in fixed locations. Further, the use of ESIMs with NGSO FSS systems can expand the reach of ESIM-enabled services, making them available outside the line-of-sight of GSO FSS networks, such as over polar regions where transcontinental aircraft routinely transit.

ESIMs are also able to operate with NGSO FSS systems using the same spectrum sharing requirements that exist for earth stations at fixed locations. For example, to enable spectrum sharing with GSO networks, terrestrial services and other NGSO FSS constellations, earth stations operating with NGSO FSS systems need to employ automated tracking, beam forming, satellite handoff, and/or frequency selection capabilities. The Commission has previously recognized in its rulemaking proceedings that these advanced technologies enable ESIMs to operate on a shared basis with other spectrum users in the same manner and with the same success as earth stations at fixed locations.<sup>11</sup>

Given the substantial public interest benefits provided by ESIMs and their demonstrated ability to operate with NGSO FSS systems using the same spectrum sharing rules as fixed earth stations, it would be appropriate for the U.S. delegation to WRC-19 to support a future agenda

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<sup>11</sup> See, e.g., Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed-Satellite Service, *Report and Order and Further Notice of Proposed Rulemaking*, FCC 18-138, ¶ 56 (Sept. 27, 2018) (discussing various methods that can be employed by ESIMs to protect fixed spectrum users).

item that considers appropriate regulatory measures to permit ESIMs to operate in every frequency band that is available for use by NGSO FSS systems. Nevertheless, as a constructive step in this direction, the Commission should support a U.S. proposal for the adoption of an agenda item for WRC-23 considering regulatory measures that may be needed to authorize the use of ESIMs with NGSO FSS systems operating in portions of the Ka-band and V-band.

**E. The Commission Should Support the Recommendation for a Draft U.S. Proposal for a WRC-23 Agenda Item on Regulatory Measures to Enable Spectrum Sharing Between NGSO and GSO Satellite Networks in the 71-76 GHz and 81-86 GHz Bands (WAC/094)**

As discussed in a prior section of these comments, Boeing is focused primarily on the V-band as the only existing greenfield opportunity for the development of NGSO FSS systems capable of providing high data rate broadband services to consumers using existing technology. It is not inconceivable, however, that the gateway links to support such V-band broadband systems could eventually operate in the 71-76 GHz and 81-86 GHz bands. Given this, Boeing supports an agenda item to address the regulatory measures that may be necessary to facilitate spectrum sharing between NGSO and GSO satellite systems in this spectrum.

In addressing this issue, some consideration should be given to whether NGSO FSS satellite systems should be given priority over GSO FSS networks in some portion of both the 71-76 GHz and 81-86 GHz bands. As the Commission has acknowledged in the context of the Ka-band, providing priority to NGSO FSS systems in certain spectrum bands is appropriate in order to give NGSO FSS system operators “greater flexibility in the coordination discussions and

ultimate deployment.”<sup>12</sup> In any event, the consideration of these issues should be carried out in the context of an agenda item for WRC-23. Boeing therefore supports this proposal.

## **II. THE COMMISSION SHOULD U.S. PROPOSALS FOR FUTURE AGENDA ITEMS THAT ADVANCE AND PRESERVE CRITICALLY IMPORTANT AERONAUTICAL COMMUNICATIONS SERVICES**

The safety and efficiency of the global aviation system depends on uninterrupted and reliable access to sufficient spectrum resources to support communication, navigation, monitoring and control of aircraft and the airspace system. The United States delegation to WRC-19 should therefore support future agenda items for WRC-23 that seek to improve the communications infrastructure for aviation and suborbital systems. At the same time, the United States should oppose any future agenda items that fail to protect adequately those frequency bands that have been identified for use for aeronautical communications, global navigation and control.

### **A. The Commission Should Support the Recommendation for a Draft U.S. Proposal for a WRC-23 Agenda Item Addressing the Treatment of Suborbital Vehicles in the Radio Regulations (WAC/080)**

As a component to the “significant revival” of the U.S. space industry referenced by Commerce Secretary, Ross, Boeing is actively engaged in the development of suborbital vehicles that can be employed for a variety of purposes. For example, Boeing is collaborating with the U.S. Defense Advanced Research Projects Agency (“DARPA”) to design, build and test a suborbital technology demonstration vehicle for the agency’s Experimental Spaceplane program. The spaceplane—called Phantom Express—would reinvent space missions for commercial and government customers by providing rapid, aircraft-like access to space. Within minutes, the

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<sup>12</sup> Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters, *Report and Order and Further Notice of Proposed Rulemaking*, 32 FCC Rcd 7809, 7814-15, ¶ 14 (2017).



autonomous, reusable spaceplane would launch its upper stage to deploy small satellites into low Earth orbit. It would then land on a runway to be prepared for its next flight.

In furtherance of such activities, the Commission should support the consideration within the ITU-R study process of changes that may be needed in the ITU Radio Regulations to facilitate the use of spectrum resources by suborbital vehicles. In supporting studies on these issues, however, Boeing is concerned about the apparent effort to address these issues primarily as “regulatory” in nature, rather than technical. There are regulatory issues that need to be resolved, such as potentially needing to define a “suborbital vehicle.” For the most part, however, the integration of suborbital vehicles into the Radio Regulations should be based purely on technical capabilities.

For example, the definition of suborbital vehicle should not be based on an arbitrary designation of a certain altitude between high altitude and suborbital flight, particularly if this distinction is used to prohibit the use by suborbital vehicles of spectrum allocated for aviation purposes. Instead, a decision regarding whether suborbital vehicles will be permitted to access frequency allocations that are designated for aeronautical use should be based entirely on the technical feasibility of using those frequencies for suborbital communications and whether such suborbital transmissions can operate on a shared basis with existing aeronautical services.

Consideration will also be needed regarding the communications systems that will be needed on-board suborbital vehicles, including operational and communications payload systems. Under an agenda item, studies could also be conducted on the identification of appropriate modifications to the Radio Regulations to support the integration of suborbital vehicles into the air traffic management system to ensure the continued safe and efficient operation of aircraft. Boeing has participated in initial ITU-R activities on these issues and believes further

consideration within the ITU-R process is needed to support the advancement of these capabilities by the U.S. aerospace industry. Most of these studies, however, will necessarily involve both technical and regulatory considerations. The Commission should therefore exercise caution in supporting a U.S. proposal for a future agenda item that considers only the regulatory aspects of these issues.

**B. The Commission Should Support the Recommendation for a Draft U.S. Proposal for a WRC-23 Agenda Item on Potential Changes to the ITU Radio Regulations to Reflect the Development of Digital Technologies in Aeronautical High Frequency Communications (WAC/081)**

The aviation industry is in the process of developing a transition to digital technologies with respect to high frequency (“HF”) radio communications. The use of digital transmissions will provide significant advantages as compared to existing analog HF communications systems, including a reduction of noise, clearer transmissions, and automatic channel management between different airplanes and functions. Such improvements are important given the fact that HF radio continues to exist as the primary long-range communications system for aircraft transiting oceans and remote areas, such as the polar regions.

Boeing therefore supports the initiation of studies in advance of WRC-23 on possible changes to the ITU Radio Regulations that may be appropriate to reflect this transition. Boeing believes that significant deliberation will be necessary and appropriate before any changes to the relevant ITU Radio Regulations should be made, but the proposed agenda item can provide a vehicle to initiate what is likely to be a lengthy review process. Therefore, Boeing believes that the Commission should support this proposed agenda item, but with appropriate precautions incorporated into the text regarding the need to carefully consider the overall implications of any changes that are ultimately proposed for consideration by future WRCs.

**C. The Commission Should Decline to Support a Future Agenda Item on Identifying Spectrum for Electronic News Gathering Unless it Expressly Refrains from Considering any Use of Frequency Bands Identified for Aviation (WAC/085)**

Boeing provides substantial and ongoing training for its workforce of more than 140 thousand people. As a result, like many large companies, Boeing uses wireless microphones, video cameras, and other television production equipment in certain of its facilities for internal education and communication purposes. Boeing therefore recognizes the very limited availability of spectrum resources for electronic news gathering (“ENG”) purposes.

In seeking to identify new harmonized frequency ranges for television production, however, the United States and other Administrations must refrain from considering the use of frequencies that are identified for global navigation (including the Global Positioning System); aircraft navigation, communications and control; or frequency bands allocated to the mobile-satellite service that are used to support aeronautical communications services. This reservation should be expressly included in any resolution addressing a future agenda item on this issue.

In seeking to enable the advancement of this recommendation for a future agenda item, Boeing urged the proponents of this potential future Agenda Item to adopt the following “resolves” in the resolution accompanying WAC/085 indicating the following:

“that taking into account the results of ITU-R studies, WRC-23 consider a secondary allocation for up to 72 MHz for ENG operations, limited to wireless microphones, between the radio frequency range 150-2000 MHz, excluding frequency bands containing the aeronautical mobile (route) service, aeronautical radionavigation service, aeronautical mobile satellite (route) service, aeronautical mobile service, mobile satellite service, and radio navigation satellite service.”

Boeing would not object to a U.S. proposal for a future agenda item with the inclusion of this language or language specifically excluding frequency bands falling within these allocations. Alternatively, the scope of the future agenda item should be limited to consider a more discrete

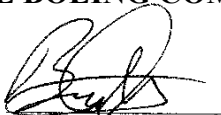
frequency range than the current proposal of seeking to identify additional frequencies for ENG within the very broad 150 MHz to 2,000 MHz range. In either event, the Commission should consider whether a WRC-23 agenda item is needed to initiate studies on this issue in light of the current ITU-R studies conducted under Resolution ITU-R 59-1 addressing the harmonization of frequencies and the identification of tuning ranges to support ENG operations.

### **III. CONCLUSION**

The Commission should support the recommendations for draft U.S. proposals for WRC-19 that further the economic growth of U.S. industry and its balance of trade with foreign countries, including in the fields of technology, communications, aerospace and aviation. To achieve these objectives, the Commission must advocate on behalf of a number of potentially competing spectrum requirements, including ensuring the availability of spectrum resources not only for 5G communications, but also for satellite communications, aviation and autonomous vehicles. Boeing highlights in these comments those WAC recommendations that seek to achieve these objectives and requests the Commission to support each of these initiatives as its proposals to WRC-19.

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